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COMPLETE SPECIFICATION.

Improvements in and connected with the Fermentation and  
Manufacture of Malt-wines.

I, Dr. ALBERT MUNSCHÉ, Chemist, of 267, Allee, Altona, in the Empire of Germany, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

- 5 This invention relates to certain improvements in and connected with the fermentation and manufacture of malt-wines.
- With regard to the product of my process it may be mentioned that it resembles the known sweet wines, Tokay wine, sherry, port wine, *etc.* according to the nature of the barm employed, and it differs from the so-called malt wines,
- 10 first, in its slight percentage of dextrine, and secondly, in its greater percentage of flavoring substances. A characteristic group of constituents of grape-wines are the flavoring substances. According to the experiments of Muller, Thorgan and Georges Jaquemin, the formation of these flavoring substances is not exclusively dependent upon the wine barm of the fermented must, but a portion of these
- 15 substances is already contained in the vine and passes from it into the grapes, and thus into the finished drink. These flavoring substances are ether like bodies, which are termed "fruit ethers." Such substances do not exist in malt. Now as additions of fruit-ethers of any kind whatever are excluded in my process the flavoring substances forming rather a part of the malt-wort I have tried the use
- 20 of barm-forming fruit-ether and have thus attained the desired ends. These barms possess the property of producing, instead of alcohol, great quantities of fruit-ether in the malt-wort. (*Betriebskontrolle in den Gahrungsgewerben, Berlin*, edition of Paul Parey. Page 216, *etc.*) The characteristic properties of the kind of barm used for the production of the flavor give rise to the different aromas.
- 25 The percentage of flavoring substances produced naturally gives a distinct wine aroma to my malt-wine, which is free from the taste of malt and renders it a nerve strengthening drink, which, moreover, in consequence of its great proportion of malt extracts, is a nourishing and strengthening agent for invalids and persons in a convalescent state.
- 30 In order to carry out my process, the following operations are necessary: first, the cultivation of barms: second, the preparation and inversion of the cane sugar solution to be added to the malt-wort; third, the production and treatment of the malt-wort; fourth, the flavoring of the malt-wort mixed with inverted sugar; fifth, the fermentation of the malt-wort by means of cultivated wine-barms and
- 35 dextrine barms added at intervals; sixth, the storage of the new wine.

In the production of a malt-wort for the cultivation of the barms I mix one hundred and fifty kilogramms of ground kiln-dried malt in a copper or wooden vat of about 600 litres capacity with four hundred and fifty litres of water at a temperature of 30° centigrade, an agitator working therein at the same time.

40 After two hours the mixture is brought to a temperature of 60° centigrade, at which temperature the mash should be left for two hours for the saccharifying process. After

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this the mixture is raised to the boiling point, and the mash in a saccharified condition is pressed out by means of a press similar to that used in the manufacture of fruit or currant wines. This expressed malt-wort is transferred to a suitable vessel, where it is maintained in a sterilized condition.

Now for the cultivation of barms a kind of grape is chosen according as the character of Tokay, Hungarian wine, sherry, or port wine is desired and is crushed and the expressed must is allowed to ferment (in a small sterilized glass vessel closed with cotton wool in connection with a thermostat) at 30° centigrade. A small quantity of the fermenting must is then taken and a culture of the barm-cells is carried on according to one of the known methods for example: (Hansens method of cultivation with a solid nourishing medium). This culture is transferred into sterilized tubes. When a sufficient quantity of the barm has formed upon the gelatine, a small portion of this barm is transferred by means of a platinum wire into a Pasteur flask of one litre capacity about three quarters full of the sweet malt-wort obtained as above described. After two days a sufficient quantity of barm forms in the Pasteur flask, and this is further cultivated in a copper flask containing from six to eight litres of the above mentioned wort. To this wort, when in complete fermentation, fifty litres of fresh wort are added, and with these the so-called "sour barm-wort" the production of which is described below. In order to increase the growth of the barm, it is advisable to periodically expose the worts to sterilized air. The temperature of fermentation is about 50° centigrade.

The barms used for manufacture of the malt wines are: I. Suitable selected pure culture wine barms and II. Dextrine fermenting barms. The reason for the use of the latter named barm may be found in the following. It is well known that the dextrines, which during the sugar generation process, produce isomaltose as well as maltose, are not directly fermentable but require an initial inversion by the after effect of the diastase during fermentation. It is quite certain that by the use of a higher temperature which has to be employed for perfect sugar production, and for destroying bacteria, the diastase is prevented from passing through the mashing and sterilisation processes without being weakened, and the consequence of this is a weak reaction of the diastase which will cease as soon as a certain quantity or percentage of alcohol has been produced. If the dextrine which has escaped the after effect is to be utilised in the production of alcohol dextrine fermentation barms are used of which two are at present known. The raising or culture of these two groups of barms takes place in lactic acid malt wort to which there has been added, more preferably and advantageously before acidulation a certain proportion of sugar.

In carrying out my fermentation process with wine barms the preparation of malt wine barm in lactic acidulated malt-wort is necessary for the production of a strongly developed sour-wine barm. This end is obtained by the process of acidifying with lactic acid the "barm-wort" which may be so called as distinguished from the great or "principal" wort. The preparation of this barm-wort is effected in the following manner: One hundred and fifty kilograms of ground malt are mixed in the same vat which was used for the production of the sweet malt-wort with the same quantity of water, four hundred and fifty litres, and then raised to a temperature of 70° centigrade by means of steam with agitation for about four hours. The mash is maintained at this temperature until completely saccharified and is then pressed out. The wort so obtained is transferred to a second vat of the same size and brought to a specific gravity of 26° to 30° Ball. by adding a solution of the finest quality of cane-sugar and is left to itself at a temperature of about 55° centigrade. At this temperature a fermentation commences accompanied with the formation of lactic acid, whereby products of lactic fermentation, develop.

The object of rendering the barm-wort sour is threefold-first, because the lactic acid has a peptonizing effect upon the albuminous bodies of the malt, and thus encourages the nourishment of the barm; second, because the lactic acid hinders



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the appearance of nitro-organisms of a harmful nature; third, because the barm thrives better in a sour medium than in a neutral.

When the desired degree of sourness of the barm-wort has been obtained, which is usually the case after about eighteen to twenty-four hours, the barm-wort now  
 5 in a sour state is cooled to about 15° to 18° centigrade by means of a cooling-coil placed therein and is mixed with the wine-barm in fifty litres of sterilized malt-wort. This I call "sour wine barm." At the expiration of a fermentation of twelve to fourteen hours the barm is ripe, *i.e.* the increase in the bulk of the barm has attained its limit. During the fermentation a considerable increase of  
 10 temperature has taken place. It should be maintained at a temperature not exceeding 32° by means of a cooler. A part of the "mature barm," as the sour fermented barm-wort is called, about forty or fifty litres, is put aside to serve as seed for the next preparation of barm. The remaining four hundred litres of mature sour fermented barm-wort is used for fermenting the sweet principal wort  
 15 produced in the meantime.

The cultivation of fruit barm is similar to that described above for the sour barm-wort. For the purpose of obtaining fruit-ether barm a glass bottle loosely closed is filled with green malt or with very moist dried malt and stored in a warm place. After a few days an intense smell of fruit-ether can be discerned.  
 20 A small quantity of this malt is put into sterilized wort and is cultivated in the same manner as above described with reference to the wine-barms and the product is what I call "fruit-ether barm."

In the preparation and inversion of the cane-sugar solution to be added to the malt-wort I mix about six hundred kilograms of white cane-sugar with forty  
 25 litres of water in a vat of about fifteen hundred litres capacity, the temperature is raised by means of direct steam to 50° to 60° centigrade during agitation. This sugar solution is mixed with fifty litres of sour malt-wort, and the liquid is maintained at a temperature of 50° to 60° centigrade for about fifteen to sixteen hours. For effecting complete inversion the liquid is afterwards raised to the  
 30 boiling point. When malt extract instead of sugar or a mixture of malt extract and sugar is used the same method is adopted.

For the production and treatment of the principal malt-wort I mix one thousand kilograms of ground kiln-dried malt in a mash tub or vat with three times as much water, and the mixture is  
 35 centigrade by means of steam. This operation occupies from eight to ten hours and after this the separation of the wort is effected by straining and pressure. The liquids drawn off from the straining vat are united with the expressed liquids and the inverted sour sugar before mentioned is added. The mixture obtained in this manner is kept at a temperature of from 70° to 75° centigrade for about one  
 40 to two hours. It is then quickly cooled, preferably by means of a water spraying cooler, to from 30° to 34° centigrade and is led by means of copper tubes to the fermenting-vat.

The fermenting vat or tub is cylindrical and has a capacity of from seven thousand to eight thousand litres. There is a cooling coil in this vat, by the agency of  
 45 which the temperature of the wort is regulated during the fermentation. Further, there is an airfeeding tube in the fermenting vat, by which sterilized air can be injected during the fermentation, according to requirements. The flow of wort into the fermenting vat is so regulated that the entire quantity will be in the vat within four or five hours. When the vat contains about five hundred litres of  
 50 wort, the preparation of fruit-ether barm before described is introduced into the vat for the purpose of flavoring the malt-wort. At the commencement pure sterilized air is injected, by which means the fruit-ether barm is caused to produce a stronger flavor. As soon as the aroma formed by the fruit-ether barm is noticeable the entrance of sterilized air is diminished and ripe sour wine barm is added  
 55 (four hundred litres) earlier or later, according to the degree of flavor desired.

In the fermentation of the principal wort the temperature should be maintained



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at about 28° degrees centigrade, because as soon as the barm begins to increase in bulk it will tend to rise in temperature.

After obtaining a certain percentage of alcohol the barm is exhausted, the cells shrink together, and the fermentation would cease if new fresh strongly fermenting barm were not added in the form of sour wine barm. For this purpose new sour wine barm matter is cultivated in the manner already described. During the process of fermentation I make repeated additions of fresh barm to the fermenting wort, so that as soon as certain percentage of sugar has been fermented the fermentation is kept going by the addition of mature barm.

The entire duration of the fermentation is from four to six weeks, according to the percentage of alcohol to be obtained. At the expiration of this time, or, indeed, before the expiration additions of fruit-ether barm are made, according to requirements and according as a more or less strong flavour is desired, as in the cultivation of the barm-forming fruit-ethers above described. When the principal fermentation is finished, the new wine is separated from the remaining barm and may be further fermented by the addition of dextrine barm if desired. The new wine should be put into warm storage at a temperature at about 50° centigrade. After being stored for one month the albuminous bodies separated by the warmth are removed by filtration and the clear wine is stored cold, almost as low as zero. In this state a further separation takes place, which can be accelerated and completed by adding suitable quantities of tannin. The wine can be again filtered and stored in barrels in a cellar in the usual manner to ripen.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed I declare that what I claim is:—

1. A process of manufacture of malt wine consisting in the addition of a lactic solution of sugar or of a lactic acid malt extract, subjecting the mixture to a temperature within 63 and 75 deg. C. with the object of producing an aroma and higher alcoholic contents and at the same time sterilizing the wort without materially interfering with the diastase, substantially as set forth.

2. A process of manufacture of malt wine which consists in the addition to malt wort which has not undergone lactic acid fermentation of a lactic acid solution of sugar or of lactic acid malt extract, subjecting the mixture to a temperature within the limits preferably of 70 to 75 deg. C. or a little lower, preparing the stock with mature sour wine barm and adding similar barm thereto from time to time during fermentation for the purpose of obtaining a higher percentage of alcohol, substantially as set forth.

3. A process of manufacture of malt wine which consists in the addition of malt wort which has not undergone lactic acid fermentation of a lactic acid solution of sugar or of lactic acid malt extract, subjecting the mixture to a temperature preferably within the limits of 70 to 75 deg. C. or a little lower, treating the product with mature sour wine barm, adding similar barm thereto during fermentation, adding fruit-ether barm during fermentation, and adding dextrine barm finally after removal of the contained barm, substantially as set forth.

4. A process of manufacture of malt wine which consists in the addition to malt wort which has not undergone lactic acid fermentation, of a lactic acid solution of sugar or of lactic acid malt extract, subjecting the mixture to a temperature within the limits of 70 to 75 deg. C. or a little lower, treating the product with mature sour wine barm, adding similar barm thereto from time to time during fermentation, adding fruit-ether, after removal of the contained wine barm adding barm produced from dextrine thereto, and finally storing the product at a high temperature but not exceeding 50 deg. C. substantially as set forth.

5. In the process of manufacture of malt wine fermenting a partially fermented and sterilized wort by successive additions of mature sour wine barm and fruit-ether barm substantially as set forth.



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6. In the process of manufacture of malt wine, effecting the fermentation by successive additions of mature sour wine barm, and thereafter completing the fermentation by means of barm produced from dextrine after having removed the wine barm.

- 5 7. In the process of manufacture of malt wine, effecting fermentation by successive additions of mature sour wine barm, removing the barm residue, further fermenting with barm produced from dextrine, and finally storing the product at a high temperature not exceeding 50 deg. C. substantially as set forth.

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